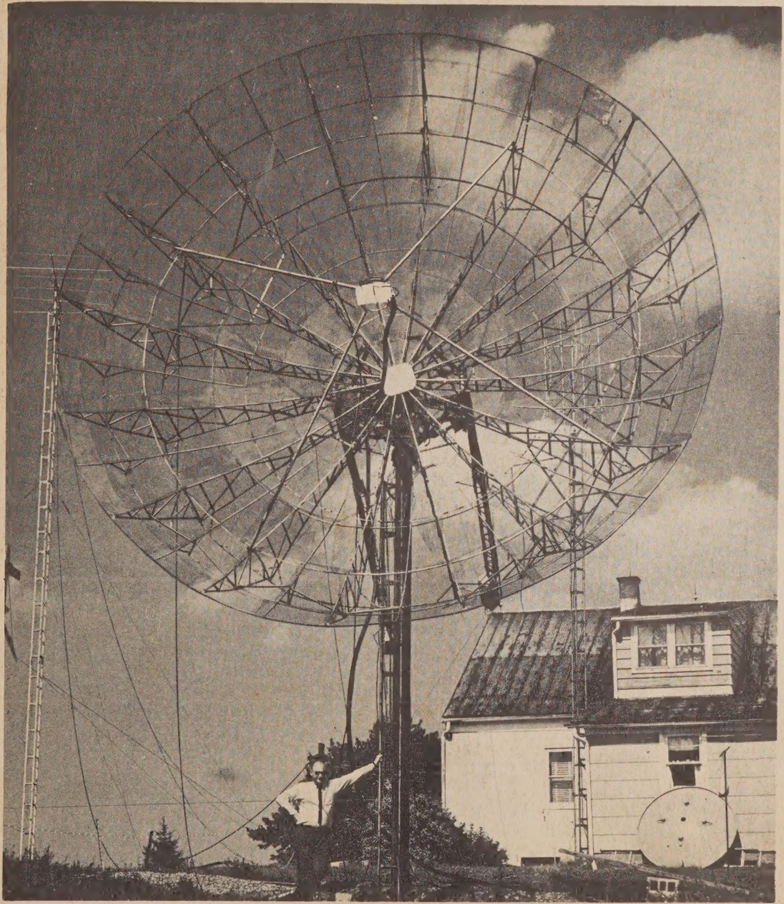
VHFER

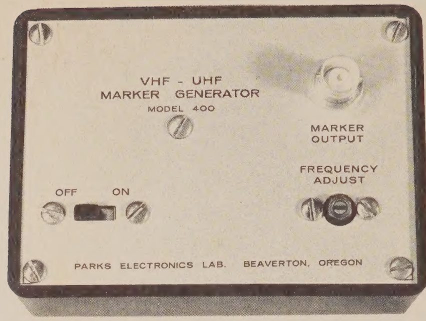
LEARN BY DOING

50 MC. AND UP

Volume 3, No. 10 October, 1965



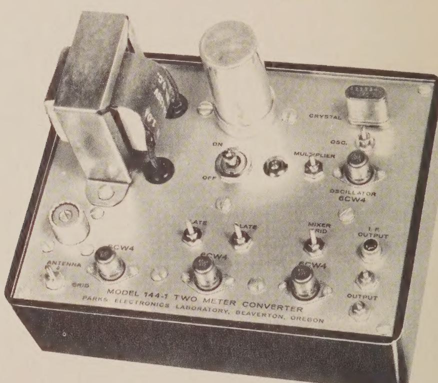
W3SDZ AND HIS 27' DISH



Here's the marker generator described in the May VHFER. We got requests from hams who wanted to buy it so we decided to make it. Price is $25, postpaid. Gives markers every 1 Mc. thru and beyond 1296 Mc. Adjust against WWV.

Nuvistor
CONVERTER
$54.95 postpaid

- Noise Figure less than 3 d.b. over full 4 Mc. Bandwidth.
- Any I.F. from 7 to 50 Mc.



PARKS ELECTRONICS LABORATORY
ROUTE 2, BOX 35 • BEAVERTON, OREGON

METALWORK for the 432 tripler described in the Sept. issue of VHFER can be obtained from Deane Kidd, W7TYR, 12235 S.W. James, Tigard, Ore.

ODDS & ENDS
by K7AAD

by K7AAD

After my other article on OSCAR in this issue was printed, I received an OSCAR Newsletter which gives some more information I didn't have. I gather that some of the material I am about to repeat is not solidified and may be in error. In other words, it is tentative data.

6 1/2 hours after blast-off, the parent Titan IIIc vehicle will reach a semi-synchronous 18,200 nautical mile orbit having a 30 degree eastward drift per day, with a 0 degree inclination angle. The OSCAR IV satellite will be separated from the parent vehicle and activated over Ecuador and will be within radio range of the USA. At this instant, radio coverage will extend 81 degrees north or south latitude. It is contemplated that the OSCAR IV package will be spin-stabilized, with satellite axis and transmitting antenna parallel to the axis of the earth. OSCAR IV will be completely solar powered, having a life of about one year. The preceeding from Project Oscar Headquarters.

The beacons seem to be the most undecided part--which one or ones will go. Several groups are working on satellite packages for OSCAR IV and subsequent satellites. As I understand it, thru the grapevine, the TRW radio club package goes in OSCAR IV and there is a beacon at 431.920. The translator is gated by the beacon signal about once every 10 minutes for a period of about 32 seconds for 12 seconds of c.w. carrier followed by one HI repeated twice.

It appears you will have to have some fairly high power on 2 to do the job. Power, of course, isn't enough by itself. You have to have antennas and I will tell you as much as I can in a nutshell without opening myself up to lawsuits. All the following is my OPINION and is derived from antenna gain measurements I have made, antenna contest results, reports from hams who do the outstanding DX work on 2 and 432 and from competent hams around the U.S. I believe the J Beam people of England are the most savvy and honest about antennas of the popular makes. They are handled by Gain, Inc. (our only advertiser though this hasn't much to do with it except that I wouldn't take their ads if I thought their products were poor.) I don't say I go along with all claims or all their theories but I do know their two meter "Skybeam" is a darned good antenna and others have reported excellent results from the original or copies of it. The Telrex 2 meter beams have a pretty good reputation for performance--but not for fulfilling gain claims. (in my opinion). My 2 meter antenna will be 2 Skybeams stacked. I am solvent enough I could buy better antennas if I thought there were better ones at a higher price, but I don't.

At 432 there is a problem. I don't know of any antenna you can buy which will do the job on OSCAR 4 unless you make an array of them. And I've seen some pretty sick manufactured arrays of Yagis. At the last antenna contest in San Jose (A.R.R.L. National Conv.) there were two highly-advertised commercial antennas for the 420 Mc. band which showed NEGATIVE gain with respect to a dipole at 432. At 420 they probably had some gain, but at 432 they sure made good attenuators. No instructions about operating at 432 came with them. I took the Skybeam for 432 and my Gibson Yagi and I would say the Skybeam did right for its size though something may have been wrong with the set-up because I have taken the Gibson to several contests (I never change it) and it didn't measure as well against the colinears as it always has before. This is one reason for the delay in the reports plus the preparation time element. Remember that a properly adjusted Yagi is fairly good below its design frequency but rapidly goes to pot above it. I went into this in some detail in an earlier issue of VHFER. The 432 colinears in Frank Jones Handbook (CQ) are very good and will deliver the gain about as specified. There are good 432 Yagi designs & we may get one in this issue by K6OKC. If not, next time. K7ZIR has an array of Yagis for 432 which bring the receiver noise up 6 db or so when swept across the sun.

(Cont'd. Next Page)

There is the possibility you won't need the big arrays to receive because of someone's miscalculation. I recall several letters and on-the-air reports of how well certain big antennas were hearing KP4BPZ's signals on CW. W7UDM and W7UAB were hearing the same CW signals 100% copy without strain on a hand-held dipole. They could not copy the ssb that way 100% but could get some of it. All of this says a lot of people have awfully sick equipment and OSCAR IV will undoubtedly provide the same opportunity of demonstrating how poor your set-up really is when we get reports from a number of stations. No more can you blame your mediocre or poor performance to your poor location or weather. VHFER should be the first magazine out to give reports.

The delay in getting VHFER out is due to overwork and understaffing here. We normally publish near the end of the month and are shooting for the middle of the month, but never seem to make it. We've had business increases like the rest of the electronics industry and have to put profitable things first to survive. Then I had an unexpected trip to Smogville (have you ever gone to bed with your eyeballs burning in their sockets?) which further delayed things. There are more hours of work in this little rag than you can imagine.

VHFER content has been heavy on 432 lately. The reason is that 432 material is about all we're receiving at the present time. I can't put in what I'm not sent. We have 1296 stuff in the works and would like to get 220 and test equipment articles (like a 432 dipper). VHFER can only be what its readers make it. Not all of you are capable of contributing,. and you should know how you stand technically. If you believe you are "with it" in a certain area of electronics, let us know what type of thing you would care to contribute. My job is to screen material (I occasionally slip up), get it printed and in the mail. We do everything except the binding and trimming here.

The converter article in this issue by K6OKC is something you should seriously consider building if you aren't set up. In Calif. they have converter contests (as well as antenna ones) and OKC came out on top in one a few months ago. He didn't include the preamp. because there were other designs around. He likes the 2N3399s best. I hope we haven't made any mistakes in the drawings or the text. I am seriously considering changing our 432 converter to one very similar to the OKC one because of our high production costs. I'm afraid we're losing money on every one we sell.

There is a pretty new Motorola transistor out, the 2N3783 ($45 each) that is significantly better than the 2N3399 and by significantly I mean a db or more. They spec. it at about 3 db I think. Our problem with it has been to prove that using that transistor in another preamp. we can tell any difference in discernibility of a weak signal over our 2N3399. So far we can't and I suspect our test set up wasn't good enough. This is also a problem in testing antennas. I ran a series of tests a couple of years ago on a 220 path to Seattle (mountains between) on signals just in and out of the noise. I used three different antennas, a home-made Yagi, an 8 over 8 J beam and a Cushcraft colinear. Field strength measurements were radically different but this may have been due to improper padding between antenna and transmitter. However, using a Transco solenoid operated radar lobing switch (very rapid switching among 3 antennas) a signal barely discernible on 1 antenna was also the same on the other two. If it was lost on one, it was lost on all three. I could use some help on this problem from some of you more savvy than I. Measuring something as being better is one thing. Proving it in practice seems quite another in some instances. End.

VHFER magazine is published monthly by Parks Electronics Lab., Rt 2, Box 35, Beaverton, Ore. 97005. Subscription rates: U.S. & possessions $2 per year, others $3 per year. Second class postage paid at Beaverton, Oregon

Moonbounce Newsletter

by Victor A. Michael, W3SDZ
Box 345, Milton, Penna.

This is the first column of what we hope will become a new dimension for the VHFER and perhaps VHF and UHF operation by amateurs. While I don't want to waste valuable space with a long discussion of my personal philosophy of Amateur Radio and the purpose of this column, I do feel a brief discussion of both can be of benefit in this first column effort.

Here we are in the year 1965, and as radio amateurs I feel it is time to return to something radio amateurs once were. In this way we can move ahead to some new and exciting frontiers. I believe that in the amateur radio ranks there should exist at least 25% of the one percenters who are willing to test their operating ability, technical knowhow, and equipment system on moonbounce experiments. If this is indeed true, then this column will be justified.

There is no royal road to a working moonbounce system. When I use the word system, I'm putting my finger on the key to the moonbounce problem; you have to develop a system for the purpose. This means you must learn how to assemble the hardware, and then evaluate the system. The Moonbounce Newsletter will be devoted to this sole purpose. I have access to a great fund of knowledge on the subject, and I'm in communication with a great number of people who know much more than I do about the subject. And, perhaps you have solved some problems that will help others. Together, I think we can come up with a column which will really show what ham radio CAN be all about, so let's try!

As I write this column, I just spent a weekend with Dick Turrin, W2IMU, an antenna engineer at Bell Labs who helped design the Andover, Maine Telstar antenna, Rodger Adson, an engineer at Bell Labs, and Cliff Schaible, W2CCY, also of Bell Labs. Together we proofed out portions of my system with the use of some laboratory test equipment. We proved some rather interesting things in our checkout - - two are significant.

The first thing we discovered is that you don't have to have a laboratory of test equipment to build a good moonbounce system. As for example: the input admittance of my homebuilt noise generator looked a trifle better than an expensive laboratory job. The feed for my dish measured an almost perfect resistive 50 ohms. My preamp. with a two-dollar transistor produces a s/n ratio that is only 2.5 db worse than a parametric amplifier that costs thousands of dollars to make. Now, I'm not saying moonbounce is easy--no indeed. I've already said it is hard. What I want to say is this-- you don't have to have a fortune in money, a laboratory of test equipment or donations of large dishes to get a system going. What you do have to have is a burning desire inside your mind that will let you think of nothing else. You must eat sleep and drink ham radio, and you must work hard--harder than you ever thought you could.

This is what burned inside the mind of Paul Godley as he sat in a cold, damp tent along the Scottish coast in the year 1921 and heard the first amateur signals across the atlantic. It was what burned inside the mind of Sam Harris as he heard the first weak 1296 Mc. signals from the moon in 1960. Now it is 1965, and the desire is burning in the minds of many to do something with ham radio above the level of discussing how nicely the panels on Brand X match Brand Y earphones. The sound of 432 Mc. signals coming over a path of almost 500,000 miles from KP4BPZ has been the spark that has lit the fire.

Following the KP4BPZ tests, it became apparent to me that there had to be better communication among the people interested in Moonbounce. I spent many dollars in phone calls trying to find out who was doing what. As I accumulated this information, I decided to share it with others, thus the Moonbounce Newsletter was born. This media was able to get advance word of the WA6LET test out to interested parties well in advance of other publications. We also started to put in technical information about how different problems were being solved by the various moonbounce crews. I was taking care of the cost of printing and mailing myself, and it wasn't long before costs got out of hand. The mailing list grew from 15 to over fifty, with most of the people interested in the technical information. From here on, all technical information I can get together, along with progress and accomplishments in the field of moonbounce will be published in this column of the VHFER. However, I will also keep a list of ACTIVE moonbounce stations. If a special test is planned by anyone that will not make the VHFER column in time, I will print a special bulletin and send it either first class or air mail to those on the mailing list at my own expense. All I ask in return, if you have a workable system, is to send me the following information to be included in the special list. Name, address, call, phone number at home (and at work if it is permissible to contact you at work.) Also include a description of your system, and results of your sun noise measurements and echo returns.

Continued on Page 6

Now for the second item of significance our moonbounce crew found out about our system this past weekend. From here on the Newsletter deals with technical facts. Over the past few weeks we have been running noise figure and signal-to-noise ratio measurements on all the 432 Mc. front ends we have around. Briefly, we found that our transistor preamp. (RCA 2N3478) produced a ten db improvement over our converter (Tapetone WTC432 - 1N21E mixer - 6BC4 i.f. strip- with a "measured?" n.f. of 7.5 d.b.) Our parametric amplifier did anything from 2 db worse to 2 db better, depending on the mode we could get the thing to tune in. Most of the time it did exactly the same as our transistor preamp. This weekend we made careful measurements of all of these front ends with two noise generators that are of the high-quality laboratory type. I know these figures will sound rather conservative, but they were made according to lab standards by fellows that use the same equipment everyday in one of the best labs in the country. My transistor preamp measured about 5.5 db. n.f. A rather elaborate paramp with an expensive circulator was measured at 3 db. In actual S/N measurement through the entire system the paramp could do no better than 2.5 db better than the transistor preamp. The conclusion to be reached here is this. With inexpensive transistors you can come within 2 or 3 db at most of a good paramp. With expensive transistors you can equal all but the most exotic 432 front ends. If you have a Parks transistor preamp or a homebuilt equivalent, work on a bigger antenna. You can always come back to the front end for another db or so, and the longer you wait the cheaper the transistors will probably get.

One of the most often asked questions among the moonbouncers is, "How much sun noise do you hear?" This is a good question, and is an area where you can find out a great deal about your system. As you probably know, the sun is a huge noise generator that travels in a path across the sky very similar to that of the moon. This allows us to use the sun for both system measurement and antenna calibration. I'm going to include here an equation for determining system performance from sun noise measurements. If used with some care, it can tell you a great deal about your system performance.

$$\frac{G_p}{F_p} = 290\,\frac{L_p}{K}\left[\left(\frac{E_s}{E_R}\right)^2 - 1\right]$$

E_s = Audio voltage when antenna is at peak of sun noise.
E_r = Audio voltage when antenna is on cold sky.

G_p = Antenna gain as a power ratio
F_p = Noise figure of front end as pwr ratio
L_p = Line loss as a power ratio
K = Factor to account for sun temperature at different frequencies.

2.9 at 144 Mc.	2.7 at 432 Mc.
2.8 at 220 Mc.	.65 at 1296 Mc.

Example of how to use the sun noise equation: Assume 3 db sun noise measured, 8 db front end noise figure and 1 db line loss.

$$\frac{G_p}{6.310} = 290\,\frac{1.259}{2.7}\left[\left(\frac{1.413}{1}\right)^2 - 1\right]$$

$$\frac{G_p}{6.310} = (290)(.466)(.997)$$

$$\frac{G_p}{6.310} = \frac{134.7}{1} \quad ; \quad G_p = 849.96$$

ANTENNA GAIN IN db = 10 Log 849.96 ; OR 29.3 db

You must remember the formula is based on a quiet sun. This is a fairly good time during the sunspot cycle to do this sort of measuring, however the temperature of the sun may still vary. The safe way to check things out is to look at your sun noise over a period of at least a week without changing any equipment in your system. If the readings vary, take the lowest reading. If the readings were consistently the same, you were probably looking at a quiet sun. Be careful of the noise figure you use for the front end. As I stated earlier in this column, your measurements may be a bit liberal. As a note of interest, we found that the 5722 noise generator tube has about 3 db excess noise on 432. It is perfectly ok on six and two, but has this characteristic around the 400 to 500 Mc. region.

One other very important area in using this formula is the matter of measuring the actual increase in the noise power output of your receiver. You will get highly exaggerated readings if a diode is used as the detector in your receiver. We found that the SSB product detector in my 75A4 is quite linear in its response. The AM detector is not. You had best check your readout system by inserting known pads in the IF line of your receiver system. It is not difficult to do. Make up three pads. Two 10 db pads to use on each end of the I.F. line and a three db pad to insert between these pads for half-power measurement. It is important that the ten db pads be used so that the three db pad will be looking into a pure resistive load in both directions. No matter how accurate the three db pad is, it will not attenuate three db unless it is driven from and works into its design resistance.

Continued on Page 7

OSCAR IV GOING UP
by K7AAD

It's high time for VHF enthusiasts to get ready for the new OSCAR--quite different from the ones before. The reason is that OSCAR will be there to use for days at a time, continuously. Formerly it was there just for short passes. But this time it is in an equatorial orbit, which makes it almost stationary. It will progress eastward at about 15 degrees per day. That means you will be able to use it for about a week at a time if you can tilt your antenna. If you can't tilt then you'll lose lots of operating time. But you need not have an elaborate tilting mechanism because you'll only need to change your antenna angle about once a day. Any mechanical means is OK, even if it means climbing the tower with a wrench.

Nothing said here previously or hereafter should be construed as official. My information came thru the grapevine. If you want accuracy you'll have to consult the bigger magazines. Keep in mind the following: 1. OSCAR may not be able to hitch a ride, though it presently looks like all is clear there. 2. Something may happen that at the last minute it doesn't work. 3. Perhaps once it gets up it won't work or won't work as planned. But if it does get up, and if it does work right, it sure is going to have a big effect on VHF operations.

OSCAR IV is a repeater. It receives between 144.100 and 144.110, only 10 kc. wide. It transmits at about 431.935 (be sure you can tune it.) The measured output power the other day was 3.5 watts. It is powered by solar panels. It will have to shut off in about a year using a chemical timing device unless they can get a command type shut off built into it by launch time----Dec. 2. Engineering time is the problem. CW will be the only usable mode. A number of QSOs can be accommodated. You may get more of your repeated signal back to earth if you use the wee hours when fewer hams will be trying to use the satel lite. On two meters you will need 100 watts and a 16 "element?" antenna. I don't understand that either. On 432 you'll need an 18 db antenna and a receiving set up with a 7 db noise figure or better. You better junk those store-bought antennas that claim fantastic gains. They aren't going to do the job. At the antenna contest a couple of well-advertised Yagis (not advertised in VHFER) actually had negative gain on 432---less gain than a dipole. At 420 they may have worked OK. Lots of you have them. That's one reason why you can't get out of your back yard. You'd do better using a wet noodle. Crystal mixer front ends will have to be preceeded by at least two stages of gain, preferably transistors. You may need to protect them from 2 meter r.f. I would do final tweaking with a weak signal coming from in front of the antenna.

OSCAR IV will be 18,000 miles high. Again, Dec. 2 is the target date. Time to get going.

The actual readout device is usually an audio voltmeter, db meter or VU meter across the audio output of the receiver. The receiver AVC should be off, the audio gain advanced to full on and the R.F. gain advanced to over-ride any audio hum by at least a six db contribution of receiver noise. Now, sweep your antenna across the sun for a maximum reading. Then continue the sweep to find a cold spot in the sky for your background reference. The difference is your sun noise measurement. Some will advise comparing against a standard resistor. I have found this method to be misleading, as the gain stability of transistor and parametric amplifiers is not constant enough to give reliable readings.

I've tried to cover the sun noise problem as well as I can. If you have specific problems or questions, please send me full details of your problem and we'll try to work it out.

Some interesting things coming up in this column will be a description of my 432 KW amplifier and a really big moonbounce antenna. My final uses inexpensive tubes, requires no lathe or brake work and develops 62% efficiency. Dick Turrin is working on the antenna design, and details will be right here in the VHFER. Keep working and let us know what you are doing.

WHAT'S WRONG WITH SILICON DIODE NOISE GENERATORS?
by Pitt W. Arnold, WØIPE

The article of W6HPH published in Sept. VHFER deals at some length with the problems he has had with his noise generator, mostly with respect to the poor VSWR of his device. I believe there is a simple reason for his problem, this being the simple fact that his diode is forward biased as indicated in his schematic, and further illustrated by the VSWR curve he includes. A silicon diode noise generator should be reverse biased to obtain noise power output, this back biasing also providing fairly high resistances even at diode currents causing high noise output.

A diagram of a silicon diode noise generator which I have used successfully for several years is shown in Figure 1. Figure 2 shows the VSWR performance of the unit at 432 Mc., and Figure 3 is a graph of diode back-resistance as a function of diode current. It is easy to see that at a maximum current of 4.7 ma. the resistance is almost 500 ohms, this value of resistance hardly affecting the input impedance of the device at all. The VSWR is not perfect, the value of 1.2 probably caused by the reactance of the 51 ohm resistor and that reactance introduced by the diode and connecting leads. The dip in the VSWR curve at about 1.25 ma. diode current is undoubtedly caused by the changing reactance of the diode.

This unit furnishes up to 15 db. of excess noise and has been calibrated against a vacuum tube diode noise generator in the bands through 432 Mc. The calibration seems reasonably constant, but the device is used mostly for comparison, not for absolue noise figure measurement. What's wrong with silicon diode noise generators? Nothing!

COMMENT BY W6HPH: WØIPE certainly has the right answer. The bad results I was getting was due to a reversed diode. It will generate noise in either direction but impedance variations are much less if it is reverse biased. Any noise generator with a VSWR curve as good as Fig. 2 should be usable on any but the most regenerative r.f. stage which rules out paramps, of course. The moral of the story is: make sure your diode is in the right way--i.e. back biased.

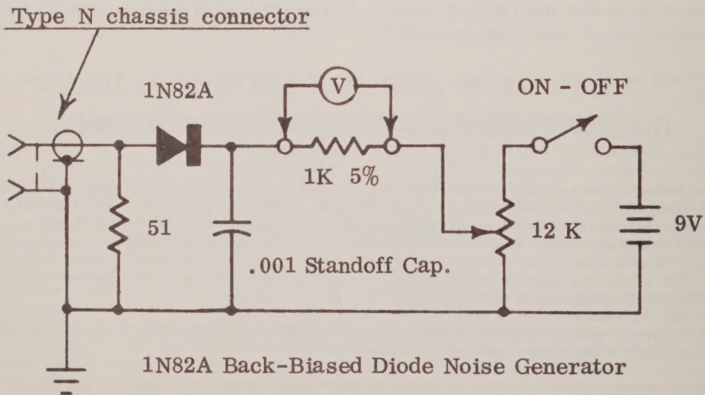
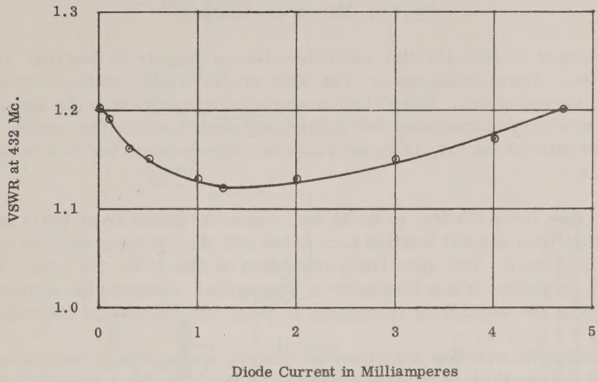
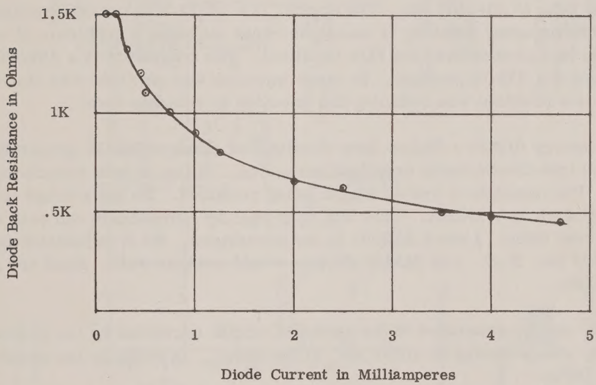


Figure 1



VSWR as a Function of Diode Current

Figure 2



Diode Resistance as a Function of Diode Current

Figure 3

DO YOU NEED A PREAMPLIFIER?

Many hams ordering our converters order a preamplifier at the same time. They must figure a preamplifier is needed to get the ultimate out of a converter. This is not so with anything we are currently building. A preamplifier can complicate matters--by giving you additional gain that makes the system unstable. However, if you have a poor or questionable converter and you build or buy a preamplifier you KNOW is good, you'll come out ahead. Sometimes the communications receiver used behind a converter is so sick that the converter doesn't have enough gain to override the receiver's noise. Then a preamp would help even tho the noise figure is no better than that of the converter. Just because you have a receiver with a "prestige" name, don't assume it is up to snuff on 28 Mc. Many aren't.

SOLID STATE 432 MC. CONVERTER

by R.L. Measures, K6OKC*

The local oscillator in most 432 Mc. converters leaves much to be desired. Overall efficiency is low. Power consumption is at least several watts. Only a few milliwatts of injection is the end result. Often other frequencies are present in the output. Starting with too low a crystal frequency and multiplying many times is the reason. Considering the present state of the art, I can see room for improvement; and that is the reason for this article.

An ideal local osc. for a 432 Mc. to 28-30 Mc. converter should be at 403.7 Mc. This will allow tuning down several hundred k.c. below 432 Mc. In the converter to be described, 432 is at 28.3. The upper limit would then be 433.7 Mc. (30 Mc.). Obtaining direct crystal oscillation at this frequency is impossible. Choosing the highest practical crystal frequency and multiplying from there to reach 403 Mc. seems reasonable.

Crystal-controlled 7th overtone transistor oscillators are capable of fair power output up to 140 Mc. A logical place to start would be 134 Mc. The final frequency could be obtained by a varactor/tripler.

CIRCUIT DESCRIPTION:

The oscillator runs at 134.567 Mc. The crystal is a 19.22 Mc. cut and oscillates in 7th overtone. The frequency stability is excellent--heat not being a problem. A constant voltage source is a prerequisite for this condition. The transistor is a 2N2369. It is a vhf powerhouse in a TO-18 package. So much injection was obtained with this device that the principle problem was reducing the injection to a usable level.

The 134 Mc. energy drives a Philco (now obsolete) or Sprague MADT germanium transistor. These transistors make excellent varactors. Philco is now manufacturing varactors only. The transistors are no longer being produced. Do not attempt using a typical "varactor" such as a 1N82A. They are very poor by comparison and cost very little less than the real thing. I use a 2N2398 in my converters. Its E-B junction suffered an overdose of 432 Mc. R.F. Any MADT Ge type would work as well. Most are priced well below the 2N2398.

The 403.7 Mc. energy generated in the varactor circuit is refined by the resonant circuit L4/C2. Pure, stable energy at 403.7 Mc. is the result. In doing so the power consumption was only 90 mw.

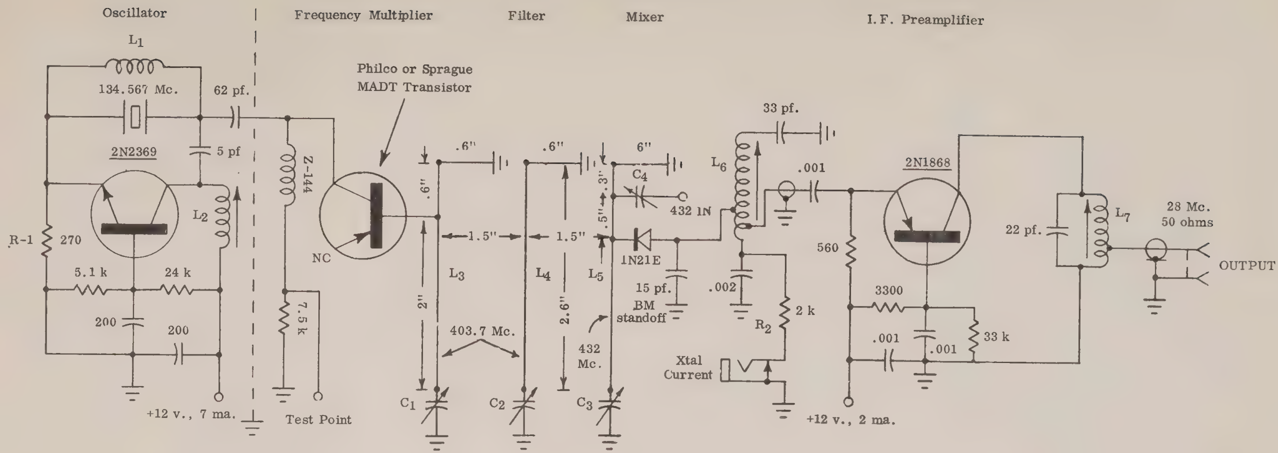
The mixer appears to be very simple. Don't be deceived. The performance is substantially the same as circuitry that is much harder to construct and occupies a great deal more space---half-wave aperture-coupled trough lines being a prime example.

The 432 Mc. signal, either barefoot or from the transistor preamplifier(s) enters the mixer line through a matching device, C4. The L.O. energy is coupled by the close proximity of L4. The resultant signal(s) in the 28/30 Mc. range produced by the mixer are allowed to pass on to L6 by the 15 pf button mica capacitor. The uhf signals are effectively bypassed. To assure no degradation of the 28/30 Mc. signal(s), approximately 22 db of amplification is furnished by a 2N1868 or 2N1745 MADT transistor. The resultant output level is such that even a poor receiver will perform adequately for the tunable I.F. The I.F. preamplifier may be eliminated if you plan on two transistor amplifier stages of R.F. pre-amplification at 432 Mc.

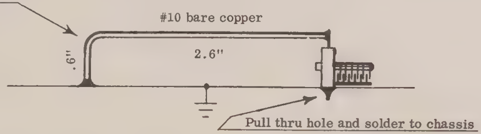
*1121 Glenwood, Oxnard, Calif.

K6OKC

432 Mc. to 28.3 Mc. Converter



L_1 6 turns #22 air wound, spaced .3", 1/4" i.d.
L_2 5 turns #20 spaced .4" on 1/4" o.d. iron slug tuned ceramic form.
L_3, L_4, L_5



L_6 14 turns #22 like L_2. Taps at 2T and 5T.
L_7 15 turns #26 3/16" form similar to L_2. Tap at 2 T.

Xtal = See text

C_1, C_2, C_3 Johnson type "U" 189-1
C_4 Johnson type "U" 189-3

All resistors are 1/2 watt composition types. In some cases, series or parallel combinations of standard values may be needed to obtain the approximate odd values used in the oscillator circuit. Z-144 is an Ohmite R.F. choke. A handwound air core equivalent can be used as a substitute. L2 tunes about 134 Mc.

Refer to Photo on Back Cover

CONSTRUCTION NOTES:

The oscillator crystal is available from International Crystal Co. It is a type FX-1, .01%, and the frequency is 57.678 Mc., 3rd overtone. The fundamental frequency is roughly 19.22 Mc. It is used on its 7th overtone. You may, if you so desire, order a 7th overtone crystal---or at least that is what the frequency shown will be. The cost is over twice as much and it does the same job. Count your pennies and take your pick. Current cost of the third overtone unit is $4.40, postpaid. Do not order a FA type crystal. The "A" indicates amateur use---the temperature tolerance is 5 times worse.

The 2N2369 currently lists for $2.40, a real bargain.

The crystal holder is made from thin-wall brass tubing. Several slots should be made to assure a firm grip on the crystal. The brass tubing and the razor saw are available in your local hobby shop.

The 4" x 6" plate, on which the converter is built, can be of any solderable material. Brass, copper, stainless steel, copper-clad epoxy board, etc. Gold plating is desirable from a weathering viewpoint. Electrically, it won't make any difference.

This converter and its companion two-stage 432 Mc. transistor amplifier have been in service at K6OKC for some time. It has been hauled to an assortment of distant mountain tops. It has been dropped and has suffered other abuses. It continues to operate perfectly. This is not too surprising, however, as there isn't too much to go wrong in the first place. Such reliability is something of a comfort at 8800 feet elevation and 60 hard miles to the nearest store.

ADJUSTMENT:

1. Peak all slug-tuned coils to their design frequencies with a dip meter. Connect a ten meter receiver to the output jack.

2. Connect a high-resistance voltmeter to the Test Point. Connect a 1 Ma. meter thru the crystal current jack.

3. Through a 25 Ma. meter, apply + 12 volts to the converter.

4. Adjust L2 for maximum voltage at the test point. 2 to 4 volts is typical.

5. Adjust C1/C2 for maximum crystal current.

6. Apply a moderate 432 Mc. signal to the input. Peak the 28 Mc. signal with C3, C4, L6, L7. Readjust C1 and C2 for optimum injection.

Adjustment Notes: After mounting in a chassis, some retuning of the UHF lines will be necessary. Holes should be cut in the bottom and sides of the chassis base to allow this operation.

In the likely event that too much or too little injection is obtained, R1 and R2 may be adjusted accordingly. The more "R" the less injection. 150 to 500 microamperes of crystal current is acceptable.

Typical power consumption is 7 to 8 Ma. at 12 volts.

OPEN BANDS

by Marilyn Wiseman, K8ALO

EDITOR'S NOTE: We are getting quite a few kicks on the quality of band openings being listed. Originally we kept reports down to 250 miles on two meters. This brought a few squawks from the low-power gang. Some hams object saying that the distance limit should be raised. On 432 we have been listing about anything that comes in. The purpose is to encourage 432 activity and to let you know who has equipment so you can sked. I see no point now in keeping the 50 Mc. reports because on true openings it makes little difference how good your equipment is or how good an operator you are. Scatter is another thing. Open Bands reports let you compare your equipment, your skill and your DX with that of others. Propagation varies tremendously with different areas--we know, so such things can be taken into consideration in reporting. By reporting the unusual and the difficult, the column can be kept interesting. Send your reports to Marilyn, not to VHFER. K7AAD

News is certainly sparse this month. Don't know what happened to the OMs who told me about the great 2-meter opening Sept. 11-12. Reports were that seven different call areas were heard or worked through the midwest and eastern sections. I missed this one as — usual, being on my way to the Findley Hamfest. I can't guarantee a good column without reports, so please send them in. My address: Box 103 Petersburg, Ohio 44454.

<u>50 Mc.</u>

Sept. 6 K7ICW (Nev.) wrkd K7BBO (Wash.) c.w. 0830. K6MLA wrkd K6GJD SSB 1015.

Sept. 11 K7ICW wrkd K7BBO, WA6HXW, W6VOD/6, W6PUZ/6 on c.w., and WB6GKK, WA6ZJN s.s.b.. 0820-0934.

Sept. 12 K7ICW wrkd WØEYE (Colo.), K7BBO (Wash.), W6GDO, WA6HYX, W6NLZ 0712-0912. WØEYE (Colo.) wrkd WB6KAP on scatter 2215.

Sept. 18 K7ICW (Nev.) wrkd W6GDO (Sacramento) SSB, K7BBO (Wash.) c.w. 0844-0855.

Sept. 19 K6MLA wrkd WA6HWX SSB 0925. K7ICW wrkd WØEYE (Colo.) hrd W7CNK.

Editor's note: The above were primarily scatter type contacts and not band openings. These contacts of 600 to 1000 miles occur every weekend morning from southern Calif. to northern Wash. and points in between plus the Nev. and Colorado. This is brute force communication with high power and reasonably good antennas.

<u>144 Mc.</u>

Sept. 11 K8BHH (Alliance, Ohio) wrkd VE3ESE, VE3BYS (Ont.), W9TWU/9, W9BRN (Ind.), K1YRT/1 (Vt), W1LUA/1 (Conn.), K9VEY (Ill.) 1503-2003. Dan reported all signals 5/9 plus. K7ICW (Nev.) wrkd K7RKH/7 at Castle Cliff, Utah, K7NII (Scottsdale, Ariz.), W6VOD/6 (Calif.) 1605-2230.

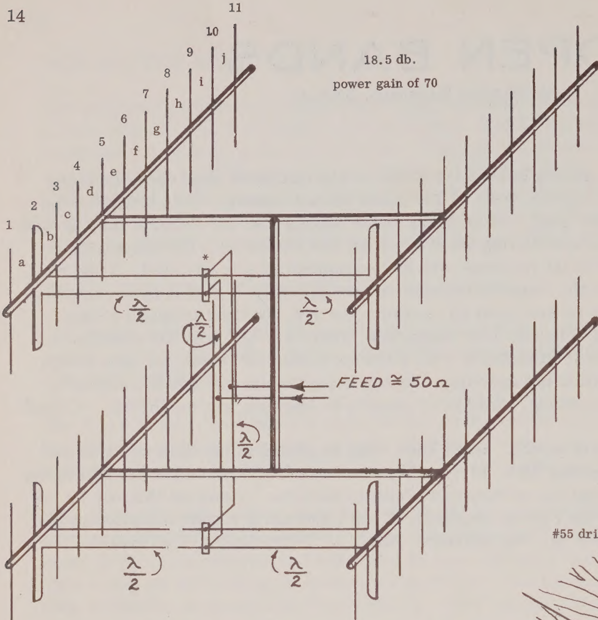
Sept. 12 K7ICW wrkd W6DQJ, W6NLZ, K6HAA, W6YVO 1944-2008.

Sept. 26 K7ICW wrkd W6DNG, W6DQJ, W6YVO, K6TSK, all over the mountains. 0810.

Oct. 2 W3ZWZ (Pittsburgh, Pa.) wrkd W4NJE (Tenn.) 400 mi. NBFM 2045.

<u>220 Mc.</u>

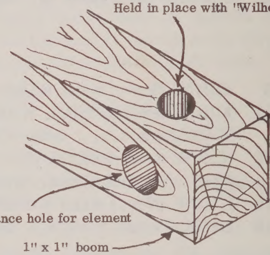
Sept. 12 K7ICW (Nev) wrkd K7RKH/7 (Castle Cliffs, Utah) 98 mi. A3 & c.w. 1135.



432 Mc. 11 Element Yagi
K6OKC

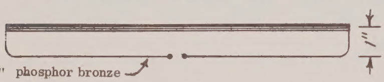
1. Boom material must NOT be metal. 1" x 1" Douglas fir preferred.
2. Elements are 3/16" aluminum welding rod, (Heliarc type.)
3. Measured gain of quad stack over reference dipole 18.5 db. with approximately 1 wavelength spacing.
4. Quad stacks are spaced 1 wavelength each direction.

#55 drill for clearance of #20 wire.
Held in place with "Wilhold" glue.



ELEMENT MOUNTING

20 gauge 1/4" copper tubing approx. .300" o.d.

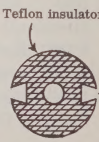


8 1/2:1 impedance dipole

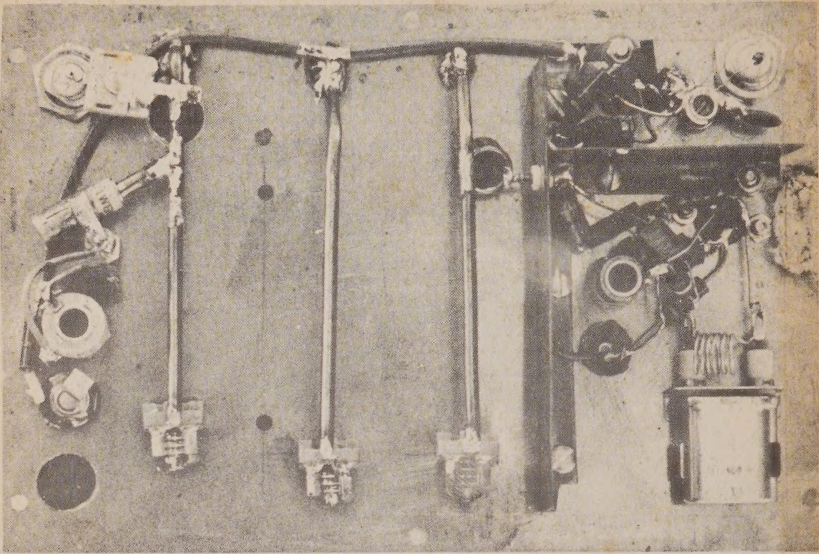
Feed lines are #10 copper spaced 3/4" to 1", hand drawn to straighten wires.

Element Dimensions and Spacings (inches)			
1	13.47	a	4.5
2	12.75	b	5.0
3	12.10	c	7.0
4	11.72	d	8.0
5	11.84	e	8.0
6	11.97	f	9.5
7	11.84	g	9.5
8	11.72	h	9.5
9	11.60	i	9.5
10	11.60	j	9.5
11	11.47		

* Teflon insulator



Make from bar stock



Continued from page 11

PROBLEMS WITH 4CX300 TUBES

Information we have received from pretty competent sources indicates you should avoid use of the 4CX300 at 432 Mc. Input characteristics are poor for this frequency. The 4X150 and 4X250 series tubes are working well.

Published by Parks Electronics Lab.
Route 2, Box 35
Beaverton, Oregon

Return Requested